CLAIMS

What is claimed is:

1. A method of forming an epitaxial silicon-containing layer on a silicon germanium surface, said method comprising:

performing an ex-situ chemical oxide removal process on said silicon germanium surface so as to remove oxygen from said silicon germanium surface, and leave a remaining amount of oxygen at said silicon germanium surface;

heating said silicon germanium surface in a chlorine containing environment to remove said remaining amount of oxygen from said silicon germanium surface; and

epitaxially growing said epitaxial silicon-containing layer on said silicon germanium surface.

2. The method in claim 1, wherein said ex-situ chemical oxide removal and heating processes increase the roughness of said silicon germanium surface by less than 1Å RMS.

3. The method in claim 1, wherein said silicon-containing layer comprises one of Si, Si_xGe_{1-x}, Si_xC_{1-x}, and $Si_xGe_yC_{1-x-y}$.

4. The method in claim 1, wherein said ex-situ chemical oxide removal comprises a hydrofluoric acid etch.

5. The method in claim 4, where said hydrofluoric acid comprises a H_2O:HF solution with ratio of 10:1 to 500:1.

6. The method in claim 1, wherein said chlorine containing environment comprises a mixture of a larger flow of hydrogen with smaller flows of HCl and DCS.

7. The method in claim 6, where the ratio of HCl and DCS is chosen to have a zero etch rate.

8. The method in claim 7, where the ratio of HCl and DCS is chosen to have a positive etch rate.

9. The method in claim 1, wherein said chlorine containing environment comprises a mixture of a larger flow of hydrogen with smaller flow of mixture of HCl with any one or any combination of SiH_4, DCS, $SiHCl_3$, Si_2H_6, and GeH_4.

10. A method of forming an epitaxial silicon-containing layer on a silicon surface, said method comprising:

performing an ex-situ chemical oxide removal process on said silicon surface so as to remove oxygen from said silicon surface, and leave a remaining amount of oxygen at said silicon surface;

heating said silicon surface in a chlorine containing environment to remove said remaining amount of oxygen from said silicon surface; and

epitaxially growing said epitaxial silicon-containing layer on said silicon surface.

11. The method in claim 10, wherein said silicon surface comprises one of a patterned strained silicon surface and a patterned thin silicon-on-insulator (SOI) surface.

12. The method in claim 10, wherein said ex-situ chemical oxide removal and heating processes increase the roughness of said silicon surface by less than 1Å RMS.

13. The method in claim 10, wherein said silicon-containing layer comprises one of Si, Si_xGe_{1-x}, Si_xC_{1-x}, and $Si_xGe_yC_{1-x-y}$.

14. The method in claim 10, wherein said ex-situ chemical oxide removal comprises a hydrofluoric acid etch.

15. The method in claim 14, where said hydrofluoric acid comprises a H_2O:HF solution with ratio of 10:1 to 500:1.

16. The method in claim 10, wherein said chlorine containing environment comprises a mixture of a larger flow of hydrogen with smaller flows of HCl and DCS.

17. The method in claim 16, where the ratio of HCl and DCS is chosen to have one of a zero etch rate and positive etch rate.

18. The method in claim 10, wherein said chlorine containing environment comprises a mixture of a larger flow of hydrogen with smaller flow of mixture of HCl with any one or any combination of SiH_4, DCS, $SiHCl_3$, Si_2H_6, and GeH_4.

19. A method of forming an epitaxial silicon-containing layer on a silicon surface, wherein said silicon surface comprises one of a patterned strained silicon surface and a patterned thin silicon-on-insulator (SOI) surface, said method comprising:

performing an ex-situ chemical oxide removal process on said silicon surface so as to remove oxygen from said silicon surface, and leave a remaining amount of oxygen at said silicon surface;

heating said silicon surface in a chlorine containing environment to remove said remaining amount of oxygen from said silicon surface; and

epitaxially growing said epitaxial silicon-containing layer on said silicon surface.